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Examining Traditional Food Processing Landscapes from the Perspective of Cultural Landscapes: Pickle-Making in Yamagata Prefecture, Japan

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Abstract: The cultural landscapes of living and living industries in Asia are changing and disappearing, and this is currently under-documented and under-discussed in the international publishing field. This study takes pickle-making in Yamagata Prefecture, Japan, as the research subject, clarifies the constituent elements and characteristics of the cultural landscapes of pickle-making in Yamagata, and analyses the formation and change of the local landscapes from the point of view of the food-processing and production activities. The elements of the cultural landscapes of pickle-making in Yamagata Prefecture were classified as follows: landscapes of cultivation sites, landscapes of processing sites, landscapes of sales sites, landscapes of cooking and eating spaces, and landscapes of special festivals. It was found that the cultural landscapes of pickle-making in Yamagata Prefecture can play a role in supporting and maintaining biodiversity and ecological balance within the region and that they are highly recognizable and inherited. The elements of the cultural landscape of pickle-making are rich and diverse, and the carriers of dependence are not fixed. Special celebrations and festivals constitute important intangible elements of food production behavior and become the spiritual connotation of its cultural landscape. The results of this study are useful in supplementing the current system of cultural landscapes in Japan and the gaps in existing research. It is also conducive to enhancing the understanding of Japanese food culture in the international publishing field and the influence of productive cultural landscapes in Japan as well as in Asia.

Keywords: Cultural landscape; Traditional food processing; Landscape components

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1. Introduction

In 1992, cultural landscapes gained recognition on the world heritage stage, with scholars highlighting their special significance in Asia and their potential as a universal model [1]. Internationally, cultural landscapes are defined as representative of various regions of the world, reflecting the combined influence of nature and human

activity and expressing a longstanding and intimate relationship between people and their natural environment [2]. In Japan, the Agency for Cultural Affairs defines cultural landscapes as those shaped by the climate of a specific region and the activities or livelihoods of its inhabitants, playing a vital role in understanding the Japanese way of life and work [3]. Both definitions emphasize the interaction between humans and landscapes; while UNESCO's definition underscores the enduring and intimate nature of this relationship, the definition from the Japanese Agency for Cultural Affairs not only focuses on humans but also acknowledges the impact of human activities on landscape formation. Cultural landscapes encompass a variety of land use practices including agriculture, pastoralism, forestry, fisheries, mining, transportation, and residential activities. Scholars consider the assessment of productive landscapes as cultural landscapes to be a significant perspective [4]. In Asia, substantial research has been conducted on cultural landscapes associated with rice cultivation and other agricultural practices [5-7], exploring their composition, evolution, and strategies to mitigate threats to cultural landscapes arising from rice cultivation. Numerous rice cultivation and agricultural landscape types are included in the list of significant cultural landscapes compiled by the Japanese Agency for Cultural Affairs [8]. Understanding the characteristics and changes of landscapes influenced by human food production practices enhances our comprehension of human-nature interactions, enriches existing cultural landscape assessment frameworks, and facilitates improved management and conservation of landscapes.

Pickle-making serves as a representative example of food production behaviors in Asia, reflecting the diversity of agricultural and culinary traditions across different regions [9]. Japanese literature dating back to the Jomon period (circa 14,000 to 300 BCE) has documented the existence of pickles [10]. Various literary and artistic works from the Edo period also depict pickles, including descriptions in "*Hibi Tokuyō Ken'yaku Ryōri Sumō Torikumi*" (A Sumo Ranking List Featuring Menus) and illustrations in "*Tsukemono Shio Ka Gen*," which educates the common people by illustrating the process of washing and drying radishes to make radish pickles. Additionally, "*Netsuta Saiten Nenchū Gyouji Zukai Yomosabunko*" depicts scenes of pickles being offered during the annual prayer festival. Thus, pickle production emerged in response to harsh geographical and climatic conditions, evolving from a necessity for survival to a culinary preference. Certain types of pickles, known as tsukemono, have historically been associated with important social customs such as gift-giving and seasonal events [11]. Understanding these factors contributes to our comprehension of Japanese food culture and land use. However, scholars have noted the dearth of sociological research on pickles, even within Japanese-language literature [11]. Existing studies on Japanese pickle production and its culture have primarily focused on its biological and chemical value, neglecting landscape research related to pickle production. Consequently, there is a lack of comprehensive analysis on the impact of traditional production behaviors on local landscapes, not only in Japan but also in other pickle-making countries like China.

In conclusion, this study focuses on Japanese pickle-making as its research subject, specifically examining Yamagata pickles among the diverse array of pickles in Japan. Yamagata Prefecture, encompassing both coastal and inland areas, showcases a variety of pickle-making practices. Tsuruoka City in Yamagata Prefecture was the first Japanese city in the field of gastronomy to join the UNESCO Creative Cities Network on December 1, 2014 [12]. Currently, there is no research focused on the impact of Yamagata pickles on the landscape. Threats to pickle-making have emerged from changes in dietary habits and cooking behaviors following World War II, as well as urbanization [11]. Overall, both sales and homemade production of Yamagata pickles are declining. This study chooses Yamagata pickle-making as its research subject to elucidate the cultural landscape elements and characteristics of Yamagata pickles, analyze the formation and changes of the local landscape through the lens of food processing activities, and contribute to addressing gaps in Japan's existing cultural landscape system and research. Additionally, it aims to enhance international understanding of Japanese food culture and bolster

the influence of productive cultural landscapes in Japan and Asia. The next section details the specific research sites of this study.

2. Research sites

Yamagata Prefecture, situated in northern Japan, boasts a rich history of pickle-making across various regions. Among its renowned varieties, *seisai-zuke* and *omi-zuke* stand out, with *seisai* (mustard, *Brassica juncea*) serving as the primary ingredient. *Seisai* reportedly originated from Chongqing, China, and was introduced to Japan in 1904. Following successful seed trials in 1908, seisai cultivation officially commenced in Yamagata Prefecture [13]. This study focused on the primary production areas of these two pickle types, namely Tendo City, Sagae City, Yamagata City, Murayama City, Oishida City, Yonezawa City, Tsuruoka City, and Shinjo City.

Fieldwork was conducted at these research sites from February 1st to February 7th, 2021, and from November 1st to November 19th, 2022. This encompassed guided tours of local pickle processing factories and wholesale markets, semi-structured interviews with facility managers engaged in pickle production and local residents, as well as drone surveys capturing footage of farmers cultivating and producing pickles on their land. Subsequently, the subsequent section will provide a comprehensive explanation of the research methods employed in this study.

3. Methods

Geographic information systems (GIS) is a widely employed research tool in landscape studies. Boundary data and land use classification data downloaded from the Territory Data Information System were used and processed in ArcGIS Pro to visualize the geographical distribution of the research sites [14]. The geographical distribution map of the research sites was generated using the JGD2000 Japan Zone 10 projected coordinate system. Furthermore, population data for Yamagata City were sourced from e-Stat [15], and the population distribution in Yamagata Prefecture's capital city was visualized in ArcGIS Pro.

Fieldwork was conducted at the research sites from February 1st to February 7th, 2021, and from November 1st to November 19th, 2022, comprising face-to-face semi-structured interviews. Initially, information on notable pickle-related facilities in the area was gathered, including vegetable-producing farms, processing factories, distributors, and educational facilities such as museums, from local news and social media. Following prearrangements and permissions, from February 1st to February 7th, 2021, we conducted on-site surveys at a vegetable-producing farm, a pickle-related product distributor, the largest local public wholesale market, and a registered tangible cultural property (building) associated with pickle production. The interviews addressed seven main topics: the core of pickle production, the impact of transportation methods on pickle production, the local history of pickle production, the influence of locally produced pickles on pickle production or fermentation-based food production in other areas, similarities and differences between pickle production in the Yamagata region and other areas, descriptions of life with pickles, disappearing landscapes in the area, and the composition of the local landscape. Vegetable-producing farmers were asked to delineate their daily and yearly schedules. High-altitude images of their vegetable fields were captured using drones to facilitate an understanding of the distribution of landscape elements. Drones, widely employed in landscape and heritage fields [16], were utilized for aerial photography of the vegetable fields.

After over a year of continued contact with local residents and facility managers, a second survey was conducted at the research sites from November 1st to November 19th, 2022. Face-to-face semi-structured interviews were conducted with 13 local residents engaged in pickle production, 4 vegetable-producing farmers, 7 shops, 1 restaurant, and 2 educational facilities. The main interview topics included the operational

status of pickle-selling shops, changes in production methods and management policies at factories, the current state of winter fields (production volume, production techniques, etc.), and landscape changes associated with alterations in production techniques. High-altitude images of the land use surrounding the vegetable fields were captured using drones. On-site surveys were conducted on historical buildings related to pickle production and exhibition materials related to pickles.

All interviews were conducted in Japanese, the local language, and recorded using both audio recordings and notes. Subsequently, the recordings were transcribed into text by the authors. In the initial phase of fieldwork, four audio recordings were gathered, comprising a total of 63,309 words. The authors then organized and extracted keywords from these interview files. During the subsequent phase of fieldwork, 59 audio recordings were obtained, totaling 582 minutes, and transcribed using automated transcription software. The transcribed text files were categorized, and keywords were extracted for analysis.

All interviews were conducted with prior consent. Personal details such as interviewees' names were omitted, and only their age range and occupation were documented. Each interviewee was identified by their occupation followed by a designated letter. Interviews commenced only after informing participants of the interview's purpose and obtaining their signed consent. The collected interview data were exclusively used for academic research and publication. The drone utilized in this study was the DJI Mini 2 model, acquired in Japan and registered on the Japanese drone registration portal. All drone operations adhered to authorized flight zones and maintained an altitude below the maximum limit of 150 meters. Permission was sought from local residents before capturing any photographs, and they were informed beforehand about the purpose of the images. This study was conducted without any conflicts of interest.

4. Results

4.1. Components of the cultural landscape of pickle-making in Yamagata Prefecture

The study area map for this study is shown in **Figure 1**, and the study area is distributed from south to north, and most of the land use in the study area is forested. Yamagata City in the middle of the picture is the capital of Yamagata Prefecture, which has the highest proportion of building area, and its population distribution is shown in **Figure 2**, where the population is unevenly distributed and concentrated on the west side.

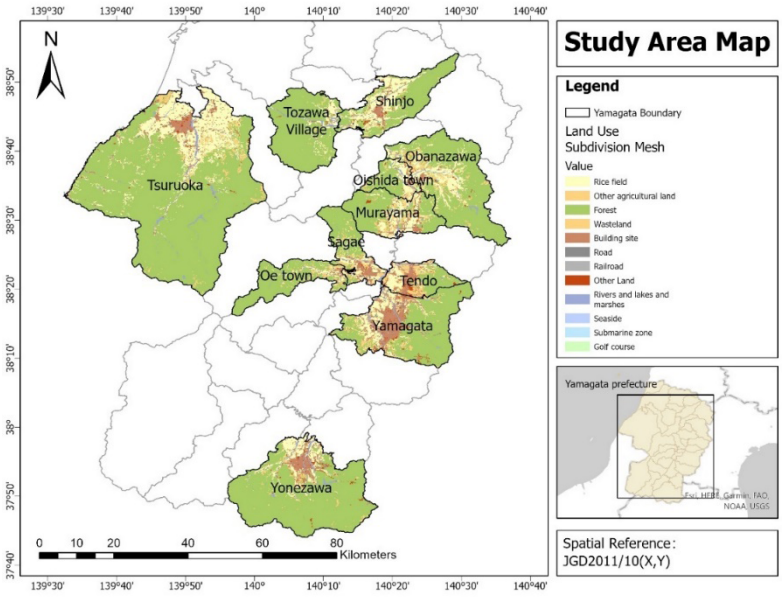

Figure 1. Study area map

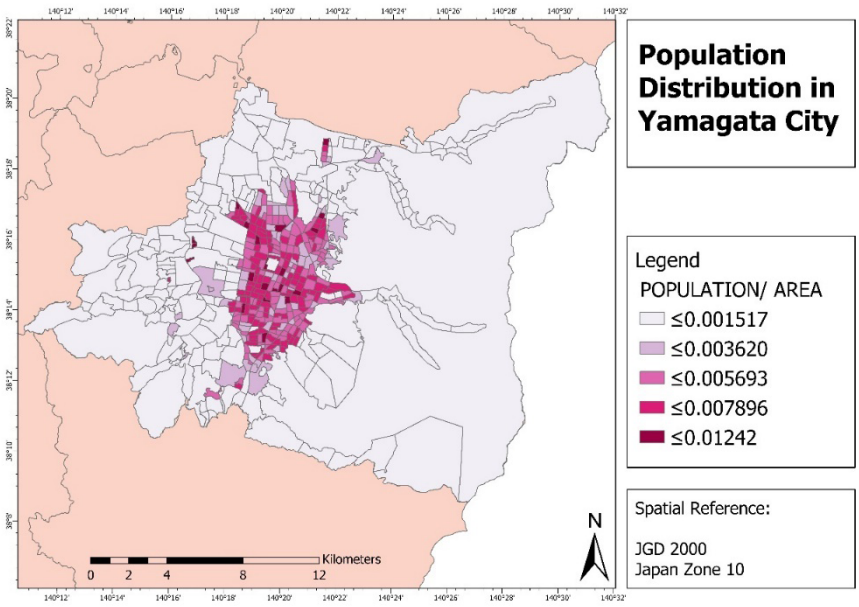

Figure 2. Population distribution in Yamagata City

After analysing the data from the two surveys, we summarised the components of the cultural landscape related to pickle-making in Yamagata Prefecture, Japan, into five components: the landscape of the cultivation site, the landscape of the processing site, the landscape of the sales site, the landscape of the cooking and eating space, and the landscape of the special festival.

4.1.1. The landscape of the cultivation site

After analyzing the outcomes of our fieldwork and interviews, various features characterizing the landscape of pickling cultivation areas in Yamagata Prefecture were identified. These include greenhouses, fertilizer stockpiles, agricultural tool arrangements (including storage facilities), settlements hosting agricultural machinery, tool shops, production complexes, work sheds, water elements such as snowmelt, watercourses, condensation, and crystallization, sites designated for vegetable waste disposal, areas allocated for storing preserved resources like firewood, signage, vegetation, and cultivated crops, as well as designated parking spaces. These landscape components are interconnected. For instance, wild birds are attracted to vegetable fertilizer (**Figure 3**), last season's vegetable waste is utilized as fertilizer for the following season after being buried, and meticulous soil mound maintenance showcases local expertise. As integral yet intangible facets of the cultural landscape, these elements underscore the capacity of cultural landscapes to foster and sustain biodiversity and ecological equilibrium within the region.

Through interviews with vegetable-producing farmers, the main mustard cultivation areas in Yamagata City are located in the Nishiyamagata, Motosawa, Sawarasawa, and Tateyama districts. Among these, pickled mustard in the Motosawa district is the most renowned. The cultivation of mustard and the production of pickled mustard are integrated into the curriculum of local elementary schools, with mustard fields set up on school grounds, indicating a culture of mustard production that is passed down through generations in this area. However, it was also observed that while there are dedicated peach orchards, celery fields, Shine Muscat grape vineyards, and cucumber farms in Yamagata City, there are no specific cultivation areas for the vegetables commonly used in pickling.

Figure 3. Birds feeding on vegetable fertilizer

4.1.2. The landscape of the processing site

After analyzing the results of fieldwork and interviews, it was observed that the elements of the landscape of pickling cultivation areas are divided into processing spaces for ordinary residents and processing spaces for enterprises. The landscape of processing spaces for ordinary residents includes areas for pickle jars, washing areas, drying areas, and storage places for pickling tools. During the first phase of fieldwork, it was observed a total of 51 households in Yamagata City, Sagae District in Nishimurayama County, and Sakata City, where pickle barrels were placed in their own yards. Due to the widespread distribution of single-family homes in Japan, pickle barrels, washing areas, and drying areas for ordinary residents are often located outdoors, such as in the yard or under the eaves. This allows the cultural landscape of pickling production to be easily observed in non-private areas, making the landscape identifiable.

4.1.3. The landscape of the processing site

The landscape of sales venues includes supermarkets, direct sales outlets, sales corners in shopping malls, convenience stores, and markets. The most famous direct sales outlet for pickled *seisai* mustard (*seisai-zuke*) in Yamagata City has been selling pickles for 40 years as of this year. Starting from November 8th each year until January of the following year, customers have the option to purchase in-store or fill out an order form for mailing. The pickles in this area adhere to the tradition of hand-picking vegetables, and with the dissolution of the Honzawa Agricultural Cooperative Women's Department, the direct sales outlet has taken on the responsibility of preserving the traditional taste.

The sale of vegetables at the public wholesale market in Yamagata City begins at 4:00 a.m. The area for selling Yamagata vegetables is located in stalls 14 and 15. Before the peak season for Yamagata vegetables arrives, this area sells daikon radishes, turnips, Japanese parsley, Yamagata sunny lettuce, and Yamagata green kale.

4.1.4. The landscape of the cooking and eating space

The landscape of the cooking and eating space of the pickle-making culture landscape in Yamagata Prefecture includes restaurants and dining tables at home. *Benkei-meshi*, a distinctive food in Yamagata Prefecture, is a traditional dish where rice balls are wrapped in the outer layer of *seisai-zuke* and then grilled for consumption. From the cultural landscape perspective of *benkei-meshi*, elements also include miso and miso breweries, as well as the origins of rice production. The cultural landscape of pickle-making in Yamagata Prefecture is not only composed of pickles themselves and related elements but is also reflected in regional cuisine through the secondary cooking use of pickles. This diversity in cultural landscape elements of pickling production showcases that the dependent carriers are not fixed.

4.1.5. The landscape of the processing site

According to the Yamagata Prefectural Museum, common events in the region include auspicious events (such as field planting and first plow), annual events (such as welcoming the rice paddy gods and sending off the rice paddy gods), and performing arts festivals (such as rice planting ritual dances and *Kagura* dances dedicated to native deities). These special celebrations and festivals, aimed at praying for a bountiful harvest, constitute important intangible elements of food production activities, forming the spiritual essence of its cultural landscape.

In conclusion, the cultural landscape of pickling production in Yamagata Prefecture plays a role in supporting and maintaining biodiversity and ecological balance within the region. It exhibits strong recognizability and inheritability. The elements of the cultural landscape of pickling production are diverse, and the carriers on which they depend are not fixed. Special celebrations and festivals constitute important intangible elements of food production activities, forming the spiritual essence of its cultural landscape.

4.2. Local residents' awareness of the cultural landscape of pickling production

After analyzing the interview transcripts, a timeline depicting the yearly and daily schedules of vegetable-producing farmers was created (**Figures 4** and **5**). The cultivation cycle of vegetables is relatively short, with only one harvest per year. During other times of the year, vegetable farmers often plant rice, cucumbers, and tomatoes. In many regions, the short harvesting cycle of vegetables becomes a reason why many farmers continue to cultivate them.

During the busy farming season, agricultural activities start at 5:30 in the morning and continue until 8:00 in the evening, lasting for 13.5 hours. However, during the off-season, vegetable farmers have less work to do and have time to eat breakfast.

Regarding pickled vegetables, local farmers have the perception that "vegetables are meant for pickling," meaning that vegetables are exclusively used for making pickles and not for any other purposes. In Yamagata Prefecture, even vegetable farmers themselves have limited knowledge about the origins and history of vegetables and pickled vegetables. Although vegetables are only sold directly rather than in supermarkets, the income is stable. The customer base for purchasing vegetables is relatively fixed, with little fluctuation. The main reason for continuous vegetable cultivation is the stable income, as farmers typically sell about 90% of their harvest, reserving only about 10% for homemade pickling.

Regarding the Yamagata Prefecture Pickle Association, all interviewed farmers expressed their lack of awareness of its existence. The association, which consists of 17 members, primarily focuses on soy sauce production and has not attracted many members from local pickle producers and related businesses. This lack of participation from local pickle producers and associated businesses contributes to the absence of macro-level management and coordination in pickle production in the region.

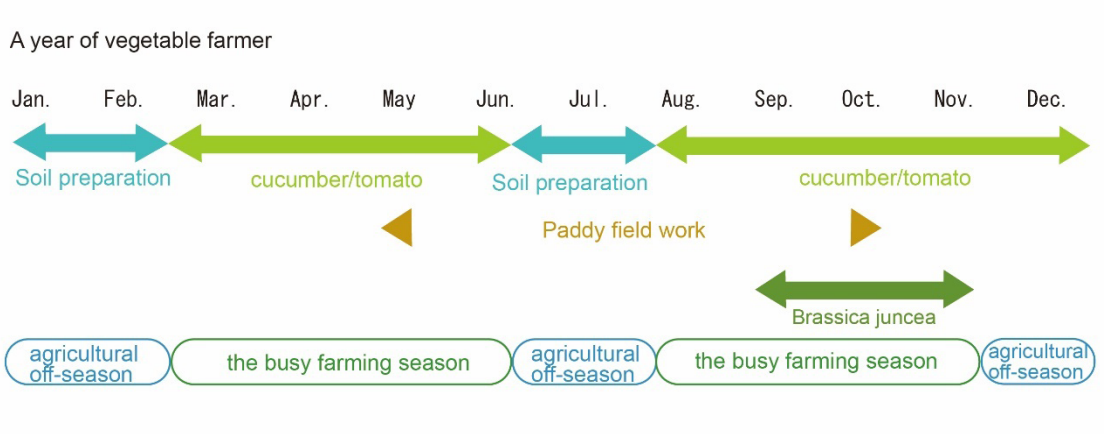

Figure 4. A year of a vegetable farmer

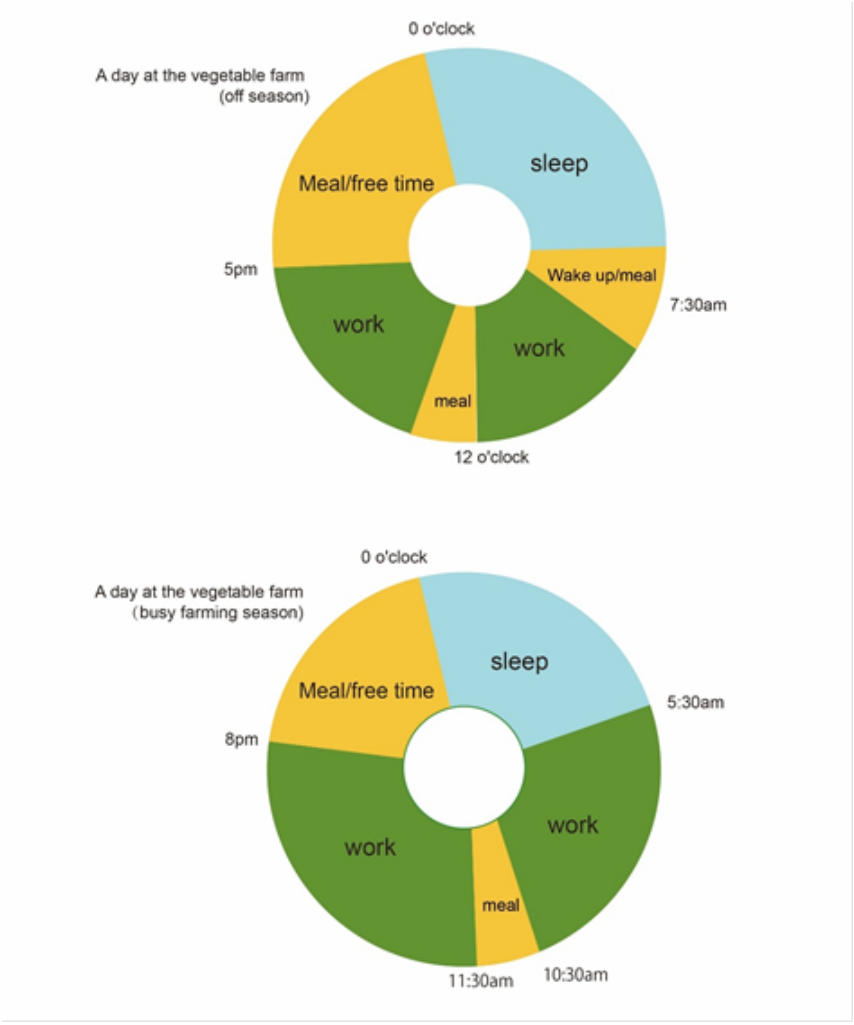

Figure 5. A day at the vegetable farm

In terms of pickled vegetables and daily life, local vegetable farmers all have their own pickling facilities and consume their homemade pickles almost every day. They believe that the development of pickles in Yamagata City is relatively limited to the prefecture, consistent with the overall development trend of Yamagata

Prefecture itself, where the cityscape remains relatively unchanged due to limited development. This contributes to the stability of the pickled vegetable cultural landscape. During the two fieldwork sessions, only one interviewee understood the concept of cultural landscape. Most respondents understood the terms "landscape" and "culture" but were unfamiliar with the specific term "cultural landscape." They do not recognize vegetable fields, trees, and snow as "landscapes," perceiving processing facilities as weeds or bulky waste instead. Additionally, the number of people producing pickled vegetables has decreased, resulting in a decline in the landscape of vegetable fields or entire rice paddies, and an increase in abandoned farmland. While the symbol of pickling is often associated with the taste created by grandparents, there is awareness among younger generations regarding the inheritance of pickling culture. The only interviewee familiar with the concept of the cultural landscape came from the Tourism and Local Products Association. They noted a decline in private events over the years, posing a threat to associated landscapes. Despite the availability of fresh vegetables in Yamagata during winter due to improved transportation, this interviewee continues to make pickles for winter consumption as part of their daily routine. They believe this practice is driven more by the deliciousness of pickles than by adherence to tradition or custom. With the declining population in their area, they feel the successors and means of inheriting dietary traditions are also diminishing. Therefore, they advocate for adding pickles to their grandchildren's diets to evoke "the taste of their childhood."

The manager of the pickled vegetable factory mentioned changes in the planting cycle, stating that in the past, they used to harvest cucumbers and then grow green vegetables, followed by another round of cucumbers or pumpkins. However, nowadays, many farmers in the area end their planting season with green vegetables as the last crop of the year. Additionally, besides producing traditional pickled vegetables, his factory has recently adopted the method of spicy pickled vegetables from Sichuan, China, by adding chili peppers to the original ingredients, thus developing new flavors of pickled vegetables. He believed that agricultural production in the region has decreased due to the lack of successors and young people, but there is a recent trend of people in their 30s and 40s leaving their jobs and becoming new farmers.

Overall, in Yamagata Prefecture, the short harvesting cycle and stable income of green vegetables have become reasons for many farmers to continue planting them, indicating the significant influence of economic factors among the elements supporting the cultural landscape. Regardless of the age distribution and occupations of the interviewees, they all expressed concerns about the threat to the inheritance of pickling traditions, showing awareness of the importance of continuing the pickling culture, whether as the older generation or the younger generation. While interviewees may not have a conscious awareness of their surroundings from a landscape perspective, they can recognize changes or even disappearances in the surrounding landscape. The details of food production scenes mentioned unconsciously during interviews, childhood memories, and carriers of emotional factors can all be regarded as important components of the cultural landscape.

5. Discussion

This study discusses the impact of traditional food production behaviors of local characteristics on the landscape and chooses pickle-making, which has not been discussed in the existing literature, as the study subject, and it was found that cultural landscapes based on traditional production behaviors of local characteristics can support and maintain the biodiversity and ecological balance within the region, and have strong identifiability and inheritance. Moreover, it was found that the elements of cultural landscapes are rich in diversity and dependent on unfixed vectors. Additionally, special celebrations and festivals are found to be important intangible elements with spiritual connotations.

The elements and effects discussed in this study are based on the landscape of pickling behaviors in Yamagata Prefecture, Japan. In Asia, many countries and regions exhibit traditional and distinctive food processing behaviors. It was hoped that the elements and effects examined in this study may serve as a reference for other countries and regions. The pickling practices in Yamagata Prefecture showcase a history of valuing long-term food preservation. As a food processing practice ingrained in the history of the region, pickling can narrate stories and histories, appropriately showcasing the interaction between human behaviors and nature, ultimately shaping the landscape. This process validates the cultural landscape approach to examining and evaluating pickling practices and their associated landscapes.

In this study, when examining cultural landscapes, it was found that the following elements of cultural landscapes change over time:

(1) Decrease of elements, the type and number of constituent elements of the landscape associated with pickle-making decreases over time.

(2) Increase of elements, the new value of elements over time, increase in the number of places to purchase, increase in the number of selling places, increase in the number of exhibition places, and increase in the number of places that used to be necessary. The constituent elements, such as the stained ware of the "preservation ground" in the past and the "meeting place and learning place" in the present, are indispensable nowadays.

(3) Certain props used to make pickles (barrels, heavy stones, water, soil, etc.) are considered stable elements. However, some props for pickles changed from wood to plastic. The eating habit of pickles changed from a winterized food to a hobby and became a part of everyday food, and the location of the washing pool and drying space changed.

6. Conclusion

This study selects pickle-making practices in Yamagata Prefecture, Japan, as the research subject to examine how the practice of pickle-making influences and shapes the landscape from the perspective of the cultural landscape. The components and characteristics of the cultural landscape of pickle-making in Yamagata were clarified, which include the landscape of the cultivation site, the landscape of the processing site, the landscape of the sales site, the landscape of the cooking and eating space, and the landscape of the special festival. It was found that the cultural landscape of pickle-making in Yamagata Prefecture plays a role in supporting and maintaining biodiversity and ecological balance within the region, demonstrating strong identifiability and inheritance. The elements of the cultural landscape of pickle-making are diverse and depend on unfixed carriers. Special celebrations and festivals constitute important intangible elements of food production behaviors, serving as the spiritual essence of the cultural landscape. As an example of complementing the theoretical gaps in established research, the results of this study serve to supplement the current system of cultural landscapes in Japan and the gaps in existing research. It also contributes to enhancing the understanding of Japanese food culture in the international publishing field and the influence of productive cultural landscapes in Japan as well as in Asia. It was believed that the core values of the cultural landscape of pickle-making include appropriate land use for pickling, lifestyle scenes for making and preserving winter foods, changing labor scenes due to technological updates, and landscape influenced by circular food processing ecology. These values may serve as references for other countries and regions in preserving and managing cultural landscapes, providing insights for evaluating and examining other landscapes based on food processing behaviors. During the investigation, we discovered a close association between pickling practices in Japan and those in other Asian countries. The seeds for pickling cabbage in Yamagata Prefecture were introduced from Chongqing, China, and there are many

similarities in production and usage habits. The tradition of pickling cabbage in the Sichuan and Chongqing regions of China has also been passed down to this day. In the future, we will attempt comparative studies between China and Japan to analyze the similarities and differences in the cultural landscape of pickle-making practices between the two East Asian countries.

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Disclosure statement

The authors declare no conflict of interest.

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